



US006300810B1

(12) **United States Patent**  
**Hardee**

(10) **Patent No.:** **US 6,300,810 B1**  
(45) **Date of Patent:** **Oct. 9, 2001**

(54) **VOLTAGE DOWN CONVERTER WITH SWITCHED HYSTERESIS**

(75) Inventor: **Kim C. Hardee**, Colorado Springs, CO (US)

(73) Assignee: **United Microelectronics, Corp.**, San Francisco, CA (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/492,727**

(22) Filed: **Jan. 27, 2000**

**Related U.S. Application Data**

(60) Provisional application No. 60/118,736, filed on Feb. 5, 1999.

(51) Int. Cl.<sup>7</sup> ..... **H03K 3/356**

(52) U.S. Cl. .... **327/206; 327/536; 327/540**

(58) Field of Search ..... **323/282, 283; 327/60, 72, 73, 77, 205, 206, 534, 535, 536, 537, 538, 540, 541, 543, 545, 546**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

5,334,890 8/1994 Hardee ..... 307/530  
5,574,681 11/1996 Foss et al. .... 365/149

5,598,122 1/1997 McClure ..... 327/538  
5,614,856 3/1997 Wilson et al. .... 327/170  
5,666,074 9/1997 Chun ..... 327/51  
6,025,707 \* 2/2000 Joo ..... 323/283  
6,127,882 \* 10/2000 Vargha et al. .... 327/540  
6,133,779 \* 10/2000 Sichert et al. .... 327/540  
6,163,190 \* 12/2000 Takai et al. .... 327/205

**OTHER PUBLICATIONS**

Changhyun, Kim, "Basic Dram Operation", Feb. 1998, Samsung Electronics.

\* cited by examiner

Primary Examiner—Jeffrey Zweizig

(74) Attorney, Agent, or Firm—Stuart T. Langley; William J. Kubida; Hogan & Hartson LLP

(57) **ABSTRACT**

A voltage down converter with hysteresis generator combining a hysteresis signal to a reference voltage and an output voltage feedback signal applied to a comparator. The hysteresis generator is coupled to a control signal giving advance notice of when a high current load is to be activated. The hysteresis signal is switched to a first state prior to the high current load activation, and switched to a second state after the high current load activation. In the first state, the hysteresis voltage is added to a reference voltage. In the second state, the hysteresis voltage is added to the voltage output feedback signal.

**8 Claims, 4 Drawing Sheets**

